AMENDMENTS TO THE SPECIFICATION

Please amend the paragraph starting at page 1, line 17 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

To address this concern, certain monitoring equipment and systems have been developed to gather data that can be useful in preventing such malfunctions from occurring. For example, programmable logic controllers ("PLCs") and human machine interfaces (**"HMIs"**) have been developed to monitor and control manufacturing equipment and processes. A PLC can be programmed to monitor and control a specific measure (i.e. flow rate) of a manufacturing process. For example, if a manufacturing process requires a flow rate of 5 gallons per minute of material, then the PLC can be programmed to continually monitor the flow rate of the process. In the event the flow rate ceases to ~~be~~ meet this 5 gallons per minute target, the PLC **can** be programmed to take adjustments to bring the process back into compliance. HMIs identify a computer system that enables a user to view the data collected by the PLC and enables the user to communicate with the PLC. Thus, in ~~our~~ **the above-stated** example, if a user desires to decrease or increase the flow rate, the user can use the HMI to instruct the PLC to do so. This data collected by the PLCs and HMIs is usually automatically stored in a database for a certain ~~duration~~ **period** of time.

Please amend the three consecutive paragraphs starting at page 2, line 7 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Manually collected data is also collected by plant personnel. Plant personnel perform tests in labs and on plant floors to determine if the manufactured products meet the required specifications. The analysis of this data is also useful in determine if a manufacturing process is faulty and/or if manufacturing equipment is malfunctioning. Further, the analysis of this data can also help determine measures that can be taken to fix the process or equipment. This data is **normally** stored in a separate database from the PLC and HMI database, **and to analyze this data with the PLC and HMI collected data, all the data is transferred to a third database.**

~~**If they have**~~ **With** the proper tools, manufacturers realize that the data collected by the PLCs and HMIs can be analyzed in conjunction with the manually collected data from tests to determine if the products are meeting the desired specifications. Current methods use system~~s~~ interfaces, redundant data entry and multiple user interfaces to analyze**,** process **and** test ~~**and**~~ **this** statistical data. Thus, vital information is not immediately accessible to the manufacturer's personnel in real time on the plant floor and cannot be used to immediately alert the plant personnel when the products do not meet the specifications. Thus, such a system and method are not useful in preventing the production of products not meeting the desired specification**s**, because the system and method does not provide real time data to the plant personnel.

Thus, among other things, it is desired to have a system and method that generates real time views of information and eliminates the heavy reliance on information technology ("IT")

personnel to build customized systems for each plant facility. It is further desired to have a system and method that eliminates the multiple data entry points (i.e., the entry of PLC and HMI collected data in one database and the entry of test data into a separate database) and that eliminates the use of multiple databases for the storing of manufacturing data (i.e., use of one database for the collection of PLC and HMI data, use of another database for test data entry, and the use of a third database for statistical processing). Moreover, it is desired to have a system and method that can easily and quickly be customized to any manufacturing plant and that enables plant personnel to configure customized views of the plant manufacturing process data. It is also desired to have a system and method that can be tailored to focus on certain specifications of the product and that alerts the plant personnel in real time when a manufacturing process is producing products that does not meet those specifications.

Please amend the three consecutive paragraphs starting at page 3, line 13 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

The present invention provides a method and system for managing and measuring the performance of any manufacturing plant or any set of manufacturing plants through the collection and analysis of manufacturing data. The method and system provides data in real time to an end user (i.e., plant personnel) and can be easily customized to any manufacturing plant and its products and processes. This system and method provides an end user with a means for creating customized reports and views of the data without relying on IT personnel. The system and method interfaces directly with a database in order to access the stored data and does not require multiple database**s**, multiple points of data entry or the transfer of data **to statistically analyze the data**.

An embodiment of the present invention comprises a method of and system for plant management. This embodiment collects and stores pieces of data from a manufacturing sub-process on a single database through a data collecting apparatus. This embodiment utilizes a key indicator dashboard ("KPI dashboard") with a statistical process control subsystem ("SPC subsystem") to access the pieces of data stored on a single database. A user of the KPI dashboard can set a range of specifications (i.e., a range of values that the data needs to fall within) for each piece of data that is collected. The SPC subsystem will notify the user of the KPI platform in real time when the value of the piece of data falls outside the range of the specifications. The data collecting apparatus can comprise a PLC, a HMI and/or a quality data entry subsystem ("QTDE subsystem"). The QTDE subsystem can contain a plurality of data

entry sheets that allow for the manual entry of test data directly into the single database. Thus, this embodiment eliminates the multiple data entry points through the collection of the PLC data, the HMI data and the data manually entered through the QTDE subsystem in the single database.

The KPI platform, along with its corresponding Ad Hoc Reporting subsystem and SPC subsystem, can generate customizable real time reports for users (i.e., plant personnel). The KPI platform can comprise a plurality of screens that allow the user to customize the platform to the specific plant, manufacturing process and the product produced. For example, ~~it~~ **the KPI platform** allows an end user to set alarms and specification values for each product and measure through the Update Alarms and Specifications screen and allows an end-user to input information specific to the plant and the manufactured products through the Products and Information screen.

Please amend the three consecutive paragraphs starting at page 8, line 8 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Figure 1 shows a diagrammatic view of an exemplary embodiment of a plant management system 10. In this embodiment, plant management system 10 is utilized to manage and monitor several manufacturing sub-processes for the production of wallboard products. As shown in Figure 1, the system 10 has manufacturing equipment 14 electronically and operatively connected to several programmable logic controllers (PLCs) 12 by means well known in the art, (i.e., sensors and wires). PLCs 12 can be programmed to measure and collect any type of data from the manufacturing equipment 14 and the manufacturing sub-process being performed. For example, ~~**PLC's**~~**PLCs** 12 can be programmed to measure and collect line speeds, temperatures, feed rates, flow rates, pressure, density, moisture, machine speed, motor speed, weight, motor amps, viscosity, width, length, and caliper measurements. PLCs 12 are electrically and operatively connected to a series of human machine interfaces (HMIs) 16 and a plant database 28 by means well known in the art (i.e., cables 18). HMIs 16 can comprise a series of computers connected to one another in a network. IT will be appreciated that electrically and operatively connected includes any number of means of connecting electronics together known in the art including, but not limited to, a network or wireless communication. Further, it will be appreciated that **the** plant database **28** can comprise any type of database known in the art, including a relational database or customized high speed storage database. ~~**These**~~ HMIs 16 allow users to monitor, control and collect data from PLCs 12. Each of the PLCs 12 and HMIs

16 monitor, measure and collect data relating to a specific and separate manufacturing sub-process that is being performed in the plant. The collected data is then transferred to and stored in plant database 28. This stored data can then be used by users to relate an end-product to each stage of it manufacturing ~~sub~~-process.

Still referring to Figure 1, HMIs 16 are connected to a process information isolation switch 20 and a plant router 22 that allows the plant to access both data local to the plant, as well as, data from other plants connected to the process information isolation switch. Plant router 22 can be electronically connected by a hi-speed phone line 25, or other like means known in the art, to another router 24 that allows a central repository, such as a database 26 at a corporate office to store the data collected by all the PLCs 12 and/or HMIs 16 in several different plants. Both the plant database 28 and the corporate database 26 are electronically connected to a plant ADC dashboard 30 and a corporate ADC dashboard 32, respectively. The ADC dashboard can reside on any type of computer or local file server and acts as an interface to the database. In one embodiment, the dashboard comprises a ~~Microsoft Excel~~ **MICROSOFT® EXCEL®** add-in that can be coded to act as the ADC dashboard. The plant ADC dashboard 30 provides a system that allows a user to view and analyze the data for the specific plant. The corporate ADC dashboard 32 provides a system that allows a user to view and analyze data for a specific plant or for a consolidated corporate view of multiple manufacturing facilities. While dashboards 30 and 32 are located in different locations, they are virtually identical and are used primarily for the same purposes.

For ease of the reader, the detailed description of the ADC dashboard focuses on the plant ADC dashboard 30. However, it will be appreciated that this discussion is equally applicable to

the corporate ADC dashboard 32. Focusing on the plant ADC dashboard 30, the dashboard provides access to a configurable key process indicator dashboard ("KPI **dashboard**") 40, a Ad Hoc Reporting subsystem, a statistical process control subsystem ("SPC subsystem") with a statistical process control module ("SPC module") 36, and a SPC Quality Report subsystem. Further, **as shown in Figure 1**, the ADC dashboard 30 is connected to a network with the plant database 28 and a quality test data entry subsystem ("QTDE subsystem") 38.

Please amend the paragraph starting at page 10, line 18 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

As shown in Figure 2b, KPI dashboard 40 comprises two date selection dropdown windows 42 and a manufacturing sub-process selection field 54. Field 54 contains several manufacturing sub-process radio buttons 55 that allow the user to select a specific manufacturing sub-process for which the user would like to see data. The user can change the title of the manufacturing sub-process radio button 55 by typing over the current name. After selecting the desired manufacturing sub-process radio button 55, a plurality of individual measures 44 will appear in a performance measure field 45. Each of these measures 44 are associated with a dropdown arrow 57 and a corresponding measure button 122. By clicking on dropdown arrows 57, the user will be presented with all the measures being collected and will be able to select the desired measure by highlighting it. For example, in this embodiment, the user has selected the "~~k~~**K**iln Temp/Moist" manufacturing sub-process in field 54 and the user has selected seven corresponding measures 44 in performance measure field 45 (i.e., zone # 1 inlet stem temp.; zone #1 exit stem temp**.**, etc.) utilizing dropdown arrows 57. Of course, the user can change, delete or add measures 44 at any time by clinking on dropdown arrows 57.

Please amend the paragraph starting at page 11, line 17 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Date selection menus 42 allow the user to select two days of interest at once for review by utilizing the corresponding dropdown arrow 57. These two dates can be consecutive or non-consecutive days. While this embodiment provides two date selection menus 42, the KPI dashboard 40 can be configured to show any number of date selection menus. When the manufacturing sub-process and the dates are selected, KPI dashboard 40 pulls all of the data from plant database 28 (shown in Figure 1) for the selected measures 44 for the selected dates. The KPI dashboard 40 then compares those measures 44 to a set of defined alarm or ~~**warning**~~ specifications. KPI dashboard 40 then calculates and displays the total number of times that these measures of the selected manufacturing sub-process exceeded or did not reach the desired specifications ~~**(i.e. an alarm)**~~ for each measure 44. In this embodiment, the KPI dashboard 40 displays the number of alarms for each measure 44 in three different columns 41. Columns 41 refer to a specific manufacturing shift (i.e., first, second and third shifts). To view the details regarding the alarms, the user can click on the alarm buttons 53 to receive more information about each alarm. This will transfer the user to an Alarms Summary screen.

Please amend the three consecutive paragraphs starting at page 13, line 20 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Referring to Figure 4a, like main KPI dashboard 40, the Alarms and Specifications screen 46 has a manufacturing sub-process selection field 54 that allows the user to select the specific manufacturing sub-process for which it desires to configure alarms and specifications. Further, the Alarms and Specifications ~~46~~ screen **46** has a measure menu 50 with corresponding dropdown arrow 57 that allows a user to select one of the twelve measures 44 selected by the user on the KPI dashboard 40 (shown in Figure 2b). Once a user selects one of the measures in menu 50, the user can configure alarms and specifications for that measure in a data entry area 52. For example, Figure 4a shows that the user has selected the Mill sub-process data tab from the field 54 and has selected the "Calcine #6 Outlet Temp" measure from the menu 50. After selecting these two items, the user is allowed to set a high and low ~~alarms~~ **alarm** and an upper and lower specification ~~limits~~**limit** for that component of the manufacturing sub-process. The user can update/store the alarm data by hitting update 435 or cancel and return to KPI dashboard 40 by clicking cancel button 436.

Referring back to Figure 2a, dropdown menu 48 also has a "View all Alarms and Specs" tab 49 that provides access to a View All Alarms and Specification screen 58. Figure 4b shows a screen shot of the View All Alarms and Specification screen 58. As shown in Figure 4b, ~~sheet~~ **screen** 58 displays the high and low alarms and the upper and lower specification limits that

have been set by the user for each product **and/or manufacturing process**. This screen allows the user to scroll up and down and side-to-side using two scroll bars 85, and allows the user to print the screen 58 by clicking on printer icon 59.

Referring back to Figure 2a, the dropdown menu 48 also has a "Plant Information and Setup" tab 56. Upon selecting tab 56, a user is transferred to a Product and Information screen 60. Figure 5 shows a screen shot of the Product and Plant Information screen 60. Screen 60 is used to define the key attributes needed to tailor the system to a specific plant's operation. As shown in Figure 5, information regarding the products manufactured by the plant can be entered and displayed in a product information field 62. In this embodiment, field 62 can contain information for up to one hundred products. Such information is split into a product description column 64, a product code column 66, a width column 68 and a PLC value column 70. The product description column 64 identifies the product being manufactured and the product code column 66 lists the corresponding product/catalog code for that product. In this embodiment, the PLC value column 70 identifies the specific PLC **Code for a product.**~~**collecting data for the manufacturing sub-process that produces that product.**~~ While field 62 of this embodiment is programmed to provide a product description, a product code, a PLC value and the width for up to one hundred products, field 62 can be programmed to provide any information desired by the user and can be programmed to store information for any number of products.

Please amend the two consecutive paragraphs starting at page 16, line 19 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Figure 7 shows a screen shot of the Three Tag Correlation Report 100. Report 100 allows a user to view the run charts for three related measures or allows a user to view the run charts for the same measure over three different time frames. **Like Analysis Report 90,** ~~**R**~~report 100 also provides radio buttons 92 that allow the user to select from a time period of two, four, eight, twelve, and twenty-four hours, hide/show product button 89, and ~~**provides**~~ time scroll buttons 96 that allow the user to move forward and backward in time. Report 100 has a main measure field 108 with a dropdown measure menu 102 and two secondary measure fields 109 each with a dropdown measure menu 103. Menu 102 allows the user to select a main measure that will be charted and compared to the two measures selected through menus 103. Menu 102 allows the user to select a main measure that will be charted and compared to the two measures selected through menus 103. Fields 108 and 109 each have time stamp windows 104. The time stamp windows 104 of fields 109 will automatically be synchronized with the time selected in time stamp windows 104 in field 108. However, the individual time stamp windows 104 will allow the user to override the automatic synchronization of the selected time frame so that each field can have a different selected time frame. Report 100 also generates a scrollable list 105 in fields 108 and 109 that displays the date and time the measure was taken, the value of the measure taken, and the product code of the product from which the measure was taken. Report 100 also generates two charts 106 on an x and y-axis that compare the main measure of field 108

individually with the other two selected measures of fields 109. The x-axis lists the date and time and the y-axis lists the value of the measures.

Figure 8 shows a screen shot of the Workbench Report 110. Workbench Report ~~100~~**110** allows the user to select up to eight separate measures of interest from dropdown menus 450. If desired, the user can select the same measure, instead of different measures, in menus 450 for charting over four different time periods. Report 110 provides eight separate time and date stamps 452 that allow the user to select the desired time and date for each measure. **Like Three Tag Correlation Report 100** ~~**As shown in Figure 8**~~, ~~**R**~~**r**eport 110 also provides **radio** buttons 92 that allow the user to select from a time period of two, four, eight, twelve, and twenty-four hours; hide/show product button 89; and time scroll buttons 112 that allow the user to scroll backwards and forward through the data on all the produced charts. Four different charts 113 are produced by ~~**R**~~**r**eport 110 in fields 116. Each filed 116 has two dropdown measure menus 450 that allow the user to select two measures to be compared to one another or a single measure to be compared over two different time frames. Further, each field 116 also has two end time stamp windows and date stamp windows 452 that allow the user to select the end time and date for each selected measure in menu 450 independently of the other measure. Each chart 113 has an x-axis that displays the date and time when the measure was taken and a y-axis that displays the value of the measures. Each chart 113 also has its own scroll buttons 115 the user to move each chart separately backward and forward in time.

Please amend the paragraph starting at page 19, line 14 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Referring back to Figure 19, top level screen 250 also has a plant dropdown menu 255 that allows the user to select the desired plant to run the report from. Figure 20b shows a screen shot of the plant dropdown menu 255. As shown in Figure 20b, the plant dropdown menu 255 presents the user with all of the plants that are tied into plant management system 10. **Referring back to Figure 19 ~~Further~~**, top level screen 250 also has a period/frequency dropdown menu 256. Figure 20c shows a screen shot of the period/frequency dropdown menu 256 of the top level screen 25. As shown in Figure 20c, period/frequency menu 256 allows a user to view the data by different period of time (i.e., a day, a week, a month, etc.) and **~~that~~** allows the user to select the frequency of the data that is seen during that time period (i.e., every 15 minutes, every hour, every 2 hours, etc.). **Referring back to Figure 19, ~~T~~**top level screen 250 also has a server dropdown menu 257 that allows the user to select the desired server to run the report from. Figure 20d shows a screen shot of the server select dropdown menu 257. As shown in Figure 20d, the user can select the server (i.e., the plant server or corporate server) from which the data is retrieved.

Please amend the paragraph starting at page 20, line 22 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Still referring to Figure 9, charts 174 and 176 plot the profile of the retrieved sample based on the caliper measures taken for that sample (the y-axis) for each inch of the width of the selected product (the x-axis). The plotted information for the knife caliper chart 174 and dry end caliper chart 176 are also displayed in knife caliper table 182 and dry end caliper table 184, respectively. The physical characteristics and properties of the particular sample are also shown on the Board Profile screen 170 in various property tables 186. In this embodiment, such characteristic and physical properties include, but **are** ~~**is**~~ not limited to, the width, weight and water loss of the selected board. Board Profile screen 170 also has scroll buttons 188 that allow a user to scroll through all the samples in the plant database that were taken prior to the specified "look before" date. Board Profile screen 170 also allows the user to display the board profiles from the code edge to the opposite edge of the board, or vice versa by selecting one of radio buttons 460.

Please amend the paragraph starting at page 24, line 12 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

If the user needs assistance in determining what the problem may be and what corrective actions should be taken, window 150 provides a "Best Practices Guide" button 164 that allows the user to access a document that provides diagnostic and preventive guidance ("Best Practices Guide"). Best Practices Guide 166 can also be accessed through dropdown menu 48 (shown in Figure 2a by selecting the Best Practices Guide tab 470. Figure 12 shows a print-out of a sample Best Practices Guide 166. As shown in Figure 12, Guide 166 provides potential reasons and solutions for specific scenarios that may be encountered during the selected manufacturing process. This will help the user select the proper code and **description of** ~~**describe**~~ the reason for the out-of-control point and the proper code and description of the corrective measure taken. Once the user selects the proper code and description of the reason for the out-of-control point from menus 156 and 158 and the proper code and description of the corrective action taken from the menus 160 and 162, the user can save this information in the plant database 28 by clicking on save button 167. If the user does not wish to save this information, the user can hit cancel button 169. Once this information is saved, it can be used to analyze process upsets and effectiveness of corrective actions.

Please amend the paragraph starting at page 26, line 12 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Figure 14 shows a screen shot of the main menu 193 of the SPC Quality Report subsystem. The subsystem allows a user to configure a statistical summary for key manufacturing sub-process measures and product tests. Such a summary can be used to monitor the current manufacturing sub-process and to analyze the impact of any process changes. As shown in Figure 14, the plant selected on the login screen is displayed in window 195, the selected server is displayed in window 197 and the specific server identifier is displayed in window 199. ~~**A dropdown menu will be enabled for switching between plants and servers if the user was required to and actually had entered a valid password in the login screen 192.**~~ The user can utilize dropdown menus 196 to select the desired month and year for the report. In this embodiment, the main menu 193 provides the user with five different dropdown product menus 187 to allow the user to select the desired products to be included in the report. While main menu 193 only allows the user to select up to five products to be included in the report, the main menu could be configured to include any number of products in the report.

Please amend the paragraph starting at page 27, line 11 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Figure 15 shows a sample Monthly Quality Report 200 generated by the SPC Quality Report subsystem for a specific plant when a user clicks the "Monthly Board Report" button 201. As can be seen in Figure 15, this ~~R~~**r**eport 200 provides five tables for each of the selected products 401 that addresses the selected measures. For this report 200, the user selected the nail pull, core hardness, edge hardness-code, edge hardness-opposite code, and end hardness measures to view for the five selected products. For each selected measure and product, the report displays the test location 402 (e.g., Lab), the number of samples tested, the manufacturing process limits, the 3 month rolling average, the standard deviation, the prior year-to-date average, the prior year average, the Cpk, the estimated defects per 1,000 units and the Cp. While report 200 shows only five products, only five measures, and the above-referenced data, the report can be customized to show any number of products, any number of measures or any number **of** calculations and data. Once generated, these reports can be electronically saved by clicking on the "save as file" button (not pictured) or the user can choose to discard the report and return to the main menu 193 of the subsystem by clicking on the "return" button (not pictured).

Please amend the paragraph starting at page 28, line 13 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Referring back to Figure 14, the user can also review and update information for all the products by clicking on the "Set-up" button 206. Figure 17 shows a screen shot of a Product Data screen 208 for all of the products. As shown in Figure 17, Product Data screen 208 allows the user to assign a PLC value 405 to each of the products. In this embodiment, the PLC value 405 ranges from 1-100 with each PLC value representing ~~**the PLC 12 (shown in Figure 1) that gathers data for**~~ a specific product ~~**produced by a manufacturing sub-process**~~. The user can place a description 406 for each product next to the PLC value that is assigned to the product. For the wallboards of this embodiment, this product descriptions starts with the caliper measure and is followed by the board type. The product code 407 is then typed in for that product. In this embodiment, the product code 407 is the catalog number assigned to each product. Further, screen 208 specifies the width 408 for each product. The rest of the columns of this chart correspond to the standard information 409 (i.e., standard speed, standard dry weight, standard water loss) that may appear on Report 200 (shown in Figure 15). Once the user is done updating and/or reviewing this product information, the user can hit return button 204 to return to the main menu 193 of the subsystem.

Please amend the paragraph starting at page 30, line 14 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

Figures 21-25 shows sample data entry screens for the QTDE subsystem 38. All of the QTDE subsystem's 38 data entry screens have some common characteristics and features. For example, each data entry screen is identified by a title. Figure 21 shows a screen shot of a Dry End Manual Data Entry screen 300. Figure 22 shows a screen shot of a Mill Manual Data Entry screen 201. Figure 23 shows a screen shot of a Wet End Manual Data Entry screen 302. Figure 24 shows a screen shot of a Knife Manual Data Entry screen 303. Figure 25 shows a screen shot of a Lab Manual Data Entry Screen 304.

Please amend the paragraph starting at page 33, line 5 of the specification as set forth below. Additions to the specification are shown in underlined and bold text and deletions from the specification are shown in strike-through and bold text.

While the present invention has been described in detail with reference to certain exemplary embodiments thereof, such description is offered by way of **a** non-limiting example of the invention, as other versions are possible. It is anticipated that a variety of other modifications and changes will be apparent to those having ordinary skill in the art and that such modifications and changes are intended to be encompassed within the spirit and scope of the invention as defined by the following claims.